

# Reproductive Performances of Bali Cows Kept by Smallholder Farmers in Bima and Dompu Regency, West Nusa Tenggara

Muhammad Andika Prasetya<sup>1</sup>, Bayu Andri Atmoko<sup>1,2</sup>, Alek Ibrahim<sup>1</sup>, I Gede Suparta Budisatria<sup>1</sup>, Panjono<sup>1</sup>, Endang Baliarti<sup>1\*</sup>

<sup>1</sup> Department of Animal Production, Faculty of Animal Science, Universitas Gadjah Mada, Jl. Fauna No 3. Kampus UGM, Bulaksumur, Yogyakarta, Indonesia, 55281

<sup>2</sup> National Research and Innovation Agency, Jl. M.H. Thamrin No. 8, Jakarta Pusat 10340

\*Corresponding author. Email: [bali\\_arti@ugm.ac.id](mailto:bali_arti@ugm.ac.id)

## ABSTRACT

Bima and Dompu regencies on Sumbawa Island become the development centers and the highest population of Bali cattle with extensive production systems in West Nusa Tenggara Province. The high population of Bali Cattle in Bima and Dompu Regencies, is a great potential to be developed as a center for Bali Cattle development. This study was conducted to investigate the reproductive performances of Bali cows kept by smallholder farmers in the Bima and Dompu Regency. The study was conducted in August 2021 by interviews with 50 farmers in Bima and Dompu Regency respectively. The reproductive management data consisted of the farmers' ability to detect the oestrous sign, a mating method applied by the farmers, the age of first mating, age of weaning, and post-partum mating. The reproductive performances data consisted of the age of first oestrous and calving, service per conception (S/C), pregnancy length, and calving intervals. The data has been presented with descriptive analysis. The farmers in Bima and Dompu Regency do have not special arrangements for the mating of their cows. In oestrous detection, farmers usually observe changes in the body condition and behaviour of their cows. The oestrous signs used were the swollen and reddish vulva, which secretes mucus, the cow wagging its tail and sniffing its genitals. The first oestrous age of Bali cows was  $26.03 \pm 5.02$  months. The S/C was  $1.59 \pm 0.49$  times. The pregnancy length was  $9.10 \pm 0.18$  months and the first calf was  $36.76 \pm 5.03$  months. The calf was weaned at  $3.93 \pm 1.10$  months and the cows have mated  $4.20 \pm 0.90$  months after calving. The calving interval was  $13.71 \pm 1.06$  months with cow's reproduction index being  $0.88 \pm 0.07$  (head/year). The reproductive management and performances of Bali cows kept by smallholder farmers in Bima and Dompu Regency were in good and normal condition.

**Keywords:** Bali cattle, calving interval, reproductive management, reproductive performances, smallholder farmers.

## 1. INTRODUCTION

Bali cattle (*Bos sondaicus*) is one of Indonesia's local cattle originating from Bali. Bali cattle are spread and kept by smallholder farmers in almost all areas of Indonesia. The Bali cattle population was estimated at 27-33% of the total cattle population in Indonesia and claimed as a national beef cattle breed due to its origin and superior productivity [1]. The population of Bali

cattle is spread in several provinces such as Bali (668,000 head), West Nusa Tenggara (492,000 head), East Nusa Tenggara (505,000 head), South Sulawesi (709,000 head), and the rest are scattered in another province [2], [3]. The high population and distribution in all areas in Indonesia proved that Bali cattle could adapt well and be suitable for maintaining and developing by smallholder farmers [4]. West Nusa Tenggara is one of the provinces that is a source of Bali

Cattle breeds and beef cattle, so West Nusa Tenggara Province sets cattle as one of the leading commodities.

The majority of people in West Nusa Tenggara become livestock farmers. One of the livestock that was widely developed is Bali cattle. Bali cattle on smallholder farms were an inseparable part of the farming system and a driving force for the community economy. Bima and Dompu regencies on Sumbawa Island become the development centers and the highest population of Bali cattle with extensive production systems in West Nusa Tenggara Province. The extensive production system in Bima and Dompu regencies is carried out by smallholder farmers, namely by releasing cows in open grazing areas all the time. The extensive system is widely applied to cows and calf operation (CCO) from birth to feeders. Meanwhile, the male calf sufficient to be used as feeders will be housed and maintained intensively. The intensive system for male Bali cattle to meet market demand during the Eid al-Adha celebration. The male Bali cattle from Bima and Dompu regencies will be delivered by livestock ship to Java Island utilizing the sea toll program. This model has been running for several years and provides a reasonably high-profit value for smallholder farmers [2], [3].

The extensive production system of Bali cows and calves certainly provides an advantage for farmers in terms of relatively low maintenance costs. To optimize farmer profits, the cows should be in good and standard reproductive efficiency. According to Budisatria *et al* [5], efficient reproduction is significant in determining profits for farmers. The ability of cows to produce a calf in a year and a low mortality rate were the keys to reproductive efficiency. Genetically, previous studies have reported that Bali cows have good reproductive performance with various production systems [5], [6]. The advantages of Bali cattle are high adaptability to various agro-ecologies and low-input production systems that are widely applied by smallholder farmers level [4].

The high population of Bali Cattle in West Nusa Tenggara, especially in Bima and Dompu Regencies, is a great potential to be developed as a center for Bali Cattle development other than Bali Island with extensive production systems and availability of land in both areas. However, a study is needed to obtain information on its reproductive efficiency. Therefore, this study was conducted to investigate the reproductive performances of Bali cows preserved by smallholder farmers in Bima and Dompu regency, West Nusa Tenggara Province.

## 2. MATERIALS AND METHODS

The study was conducted in accordance with ethical clearance No 00018/EC-FKH/Eks..2021. The study was

conducted in August 2021 by interviews with 50 farmers in Bima Regency and 50 farmers in Dompu Regency respectively. This study involved 100 farmers of respondents, 200 adult Bali cows in Bima and Dompu Regencies. The location of the study was determined by purposive sampling with the consideration that: 1) The location was close to Balai Pembibitan Ternak Unggul Manggalewa, Dompu Regency. It was hoped that the distribution of superior breeds could be widespread in smallholder farmers in Bima and Dompu Regencies. 2) The location has a large population of Bali cattle, in Bima Regency (Monta District with 4,522 heads) and Dompu Regency (Pekat District with 32,283 heads) (BPS NTB, 2021). The study was used a purposive sampling method for farmers as respondents. Farmers were selected in Pela Village and Sie Village, Monta District, Bima Regency. Pekat Village and Sori Tatanga Village, Pekat District, Dompu Regency. The consideration for selected the farmers that: 1) has a relatively large livestock population, 2) each farmer has 2 - 5 heads of Bali cows, 3) the age of Bali cows was 3 - 8 years, 4) has an extensive production system, 5) the farmer agreed and gave permission to become the study respondent, and 6) the location was easily accessible and can be used for data collection.

The reproductive management data consisted of the farmers' ability to detect the estrous sign, a mating method applied by the farmers, the age of first mating, age of weaning, and post-partum mating. The reproductive performances data consisted of the age of first estrous and calving, service per conception (S/C), pregnancy length, calving intervals, and cow reproduction index. The data has been presented with descriptive analysis.

## 3. RESULTS AND DISCUSSION

The result of this study was described in Table 1. The farmers do not have a special arrangement for the mating method for their Bali cows. The farmers were done to determine and detect estrous and usually observe the changes in body condition and behavior of their Bali cows. The farmers used several estrous signs to determine and detect estrous, such as the vulva looking red (reddish), secreting mucus, and feeling warm. The cow will also be seen wagging their tail and sniffing their vulva. Baliarti *et al* and Atmoko *et al* [7], [8], reported that sexual behavior (mounting and standing to be mounted) and vulva characteristics (redding, swelling and mucus secretion) showed in the estrous phase. The farmers will mate the cow if the cow has shown signs of riding other cattle. Most farmers choose to mate their cows naturally due to easier and free of cost. Sometimes if the farmer wants a good calf from their cows, they will mate with artificial insemination with superior frozen semen. However,

some farmers mate their cows with artificial insemination (IB) on their Bali cows to get calf better and larger than natural mating using a normal bull (the farmers do not have a superior bull). The cost for artificial insemination was around Rp. 200,000-300,000. The type of frozen semen (breed) that was chosen to mate their cows is Bali cattle. Budisatria *et al* [5] reported that most farmers in both intensive and semi-intensive production systems were able to detect the oestrous of their Bali cows well (69.57 and 59.09%) and mate their cattle with artificial insemination (70.83 and 86.11%).

**Table 1.** Reproductive management and performances of Bali cows kept by smallholder farmers in Bima and Dompu regency

Parameters	Min.	Max.	M±SD
The age of first oestrous (months)	18.00	37.00	26.03±5.02
The age of first mating (months)	18.70	37.40	26.55±5.02
Service per conception (times)	1.00	2.00	1.59±0.49
Pregnancy length (months)	9.00	9.50	9.10±0.18
The age of first calving (months)	28.40	48.30	36.76±5.03
age of weaning (months)	3.00	6.33	3.93±1.10
post-partum matting (months)	3.00	6.03	4.20±0.90
Calving intervals (months)	12.00	15.73	13.71±1.06
Cow reproduction index (head/year)	0.76	1.00	0.88±0.07

Based on Table 1, The first oestrous age of Bali cows was 26.03±5.02 months, and at that time the cows were immediately mated naturally by the farmers. The service per conception was 1.59±0.49 times. The pregnancy length was 9.10±0.18 months and the first calf was 36.76±5.03 months. The calf was weaned at 3.93±1.10 months and the cows have mated 4.20±0.90 months after calving. The calving interval was 13.71±1.06 months with cows reproduction index being 0.88±0.07 (head/year). The reproductive performance of Bali cows in the Bima and Dompu regencies was not different from the results of previous studies on Bali cows in the South Konawe Regency [5]. Budisatria *et al* [5] reported that a significant difference in intensive and semi-intensive production systems related to reproductive management and performance at the first

age of oestrous (1.98±0.82 vs 1.92±0.18 years), age at first mating (2.84±0.23 vs 2.77±0.34 years), service per conception (S/C) with artificial insemination (1.70±0.76 vs. 1.44±0.57 times). There were no significant differences in the age of first calving, duration of pregnancy, postpartum oestrous, postpartum matting, weaning age, and spacing. The pre-weaning mortality rates were 6.25 and 9.68%, respectively.

One of the factors that influence the high rate of repeated mating and S/C is the ability of farmers to detect oestrous [9]. Faster weaning can increase the reproductive efficiency of the cows [10]. Weaning affects the longer ovulation time in the cows. Ovulation can occur 15-30 days after calving, but cows do not show oestrous behaviour [11]. In lactating cows, there is the production of the hormone prolactin, which affects the regulation of oestrogen and progesterone to the hypothalamus. The oestrogen plays a vital role in the oestrous phase, with the appearance of visual signs of oestrous [12]. Differences in PPM can be affected by the ability of oestrous detection and delay in mating because the calf is still suckling. Farmers in this research chose not to mate their cows after the first sign of oestrous appeared but to mate in the subsequent oestrous, making the PPM longer. The calving interval was affected by PPE, PPM, S/C, age at first mating, mating management [5], [13], [14]. Longer calving intervals indicate lower reproductive efficiency. The longer CI is the result of the high incidence of postpartum anoestrous and high S/C rate. Calving interval affects the reproductive performance of the cows in one year [7]. According to Diskin *et al* [15] reproductive efficiency determines profits and depends on the production system used. Reproductive performance depends on the reproductive management carried out by the farmers. Chawala *et al* [16] stated that smallholder farmers traditional breeding and production systems were usually carried out without control. Moreover, with an extensive production system on free grassland, the quantity and quality of forage are quite low [17].

#### 4. CONCLUSION

In conclusion, the reproductive management and performances of Bali cows kept by smallholder farmers in Bima and Dompu Regency were in good and normal condition.

#### AUTHORS' CONTRIBUTIONS

All authors conceived and planned the experiments. MAP carried out the data collection. AI was analysed the data, BAA and IGSB took the lead in writing the manuscript. IGSB, P and EB supervised the study, All authors contributed to the interpretation of the results and also provided critical feedback and helped shape the research, analysis, and manuscript.

## ACKNOWLEDGMENTS

The authors are thankful to the Ministry of Research and Technology/National Agency for Research and Innovation, Republic of Indonesia, for funding this study with grant no. 6/E1/KP.PTNBH/2021 and contract no 1702/UN1/DITLIT/DIT-LIT/PT/2021 and all farmers have given permission and provided research material.

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